Early Brain Development, Epigenetics and the Need for Community Action

Nancy Swigonski, MD, MPH, FAAP
Professor, Department of Pediatrics and Fairbanks School of Public Health
Indiana University School of Medicine
Nancy Swigonski, MD, MPH
• Professor of Fairbanks School of Public Health and Department of Pediatrics, IU School of Medicine
• Co-chair of Indiana’s Perinatal Quality Improvement Collaborative, Quality Improvement Committee
• Executive Director of Quality Innovation for the Riley Maternity and Newborn Health initiative
• Medical director of Child Health Improvement Partnership – Indiana or CHIP-IN

• nswigons@iu.edu

No financial disclosures
Critical Points

1. Brain grows rapidly in first 3 years of life
2. Genes serve as a blueprint for brain architecture but “epigenetic” mechanisms determine what is turned on and off
3. There is an intersection of neurobiology and epigenetics that determines the brain architecture – i.e., circuits and connections
   a) That get used get stronger
   b) That aren’t used get pruned
Critical Points

4. Early experiences can change brain development
5. Importance of developmental screening
6. We can do something about it
Critical Points

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Head circumference-for-age percentiles:
Boys, birth to 36 months

Published: May 30, 2000.
SOURCE: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000).
Head circumference-for-age percentiles: Boys, birth to 36 months
Neurodevelopmental Biology

Brain is not structurally complete at birth

- Birth
- 6 months
- 2 years old
Critical Points

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Deoxyribonucleic acid (DNA)
• Carries genetic information
• Determines our characteristics
• Is the same in every cell
Different Cell Types with the Same DNA
Epigenetics

• Information on top of DNA code –
  – turn the gene expression on and off
  – silencing some genes and activating others

• Two main mechanisms
  – DNA Methylation: suppresses gene expression
  – Histone Acetylation: makes gene expression easier
Epigenetic mechanisms not only occur during fetal development, when cells are specializing

BUT also continues after birth and is influenced by the environment and our experiences!
Temperature-Dependent Appearance *Bicyclus*

- **Dry-season form**
- **Wet-season form**

*Distal-less* expression in imaginal disc

- <20°
- >24°
Genetically Identical

Different Disease
3 year old identical twins

60 year old identical twins
Critical Points

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   – That get used get stronger
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Brain Grows Rapidly Followed by Pruning

Rapid growth

Birth

6 years old
Brain Grows Rapidly Followed by Pruning

Rapid growth

Pruning

Birth
6 years old
14 years old
Sensitive Periods in Early Brain Development

Graph developed by Council for Early Child Development (ref: Nash, 1997; Early Years Study, 1999; Shonkoff, 2000.)
Sensitive Periods in Early Brain Development

- Vision
- Hearing
- Emotional control
- Habitual ways of responding

Graph developed by Council for Early Child Development (ref: Nash, 1997; Early Years Study, 1999; Shonkoff, 2000.)
Sensitive Periods in Early Brain Development

Graph developed by Council for Early Child Development (ref: Nash, 1997; Early Years Study, 1999; Shonkoff, 2000.)
Brain Grows Rapidly Followed by Pruning

Rapid growth  Pruning

Birth  6 years old  14 years old
Brain Grows Rapidly Followed by Pruning

Rapid growth

Birth

6 years old

14 years old

Pruning

Politician
Critical Points

4. Early experiences can change brain development

5. Importance of developmental screening

6. We can do something about it
Healthy Child vs. Severe Neglect.
Toxic Stress Changes Brain Architecture

Radley et al. (2004); Bock et al. (2005)

Prefrontal Cortex and Hippocampus

Normal

Typical neuron—many connections

Toxic stress

Damaged neuron—fewer connections
Family Stress, Cortisol & Brain Development

• Early Social-Emotional Functioning and Public Health: The Relationship Between Kindergarten Social Competence and Future Wellness
  – Followed children for 13-19 years
  – Social-emotional skills in kindergarten were associated with key young adult outcomes – education, employment, criminal activity, substance use and mental health
Family Stress, Cortisol & Brain Development

- Tracing Differential Pathways of Risk: Associations Among Family Adversity, Cortisol and Cognitive Functioning in Childhood
  - Suor, et. al., Child Development 2015
  - 201 low income children followed for 3 years
  - Family instability and emotional maternal unavailability predicted abnormal cortisol levels and lower child cognitive function at age 4
Social Interactions Affect Neuroendocrine Function and Behavior

Helping Foster and Adoptive Families Cope with Trauma

American Academy of Pediatrics
Three Levels of Stress

National Scientific Council on the Developing Child, Shonkoff

Positive
Brief increases in heart rate, mild elevations in stress hormone levels.

Tolerable
Serious, temporary stress responses, buffered by supportive relationships.

Toxic
Prolonged activation of stress response systems in the absence of protective relationships.

Nancy Swigonski, MD, MPH, FAAP
nswigons@iupui.edu
TOXIC STRESS

CHILDHOOD STRESS

Hyper-responsive stress response

Chronic “fight or flight;” adrenaline / cortisol

Changes in Brain Architecture

Garner, Translating Developmental Science into Healthy Lives

Nancy Swigonski, MD, MPH, FAAP
nswigons@iupui.edu
Significant Adversity Impairs Development in the First Three Years (ACE Study)

Barth, et al. (2008)
Disparities in Early Vocabulary Growth


Professional Families 1,116 words
Working Class Families 749 words
Poverty Families 525 words
Disparities in Early Vocabulary Growth


The Early Catastrophe: The 30 Million Word Gap by Age 3

Professional Families: 1,116 words
Working Class Families: 749 words
Poverty Families: 525 words
Experience Can Change the Actual Structure of the Brain

• Brain development is “activity-dependent”
• Every experience excites some neural circuits and leaves others alone
• Neural circuits used over and over strengthen, those that are not used are dropped resulting in “pruning”

From presentation entitled: Nurturing the Developing Brain in Early Childhood; Lisa Freund, Ph.D. The National Institutes of Health; The Eunice Kennedy Shriver; National Institute of Child Health and Human Development
Neurodevelopmental Biology and Epigenetic Intersection

Early life experiences trigger epigenetic modifications that alter neuroendocrine levels, brain structure and brain function.
Neurodevelopmental Biology and Epigenetic Intersection

Early life experiences trigger epigenetic modifications that alter neuroendocrine levels, brain structure and function

Nature vs Nurture

Nancy Swigonski, MD, MPH, FAAP
nswigons@iupui.edu
Neurodevelopmental Biology and Epigenetic Intersection

Early life experiences trigger epigenetic modifications that alter brain structure and function

Nature and Nurture Complex Intersection
Critical Points

4. Early experiences can change brain development
5. Developmental screening
6. We can do something about it
Identifying Infants & Young Children with Developmental Disorders in the Medical Home: Algorithm for Developmental Surveillance & Screening

*Pediatrics* 2006;118:405-420
Problems in Early Identification

• Fewer than 30% of children with developmental delays are identified before entering school
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• While we may find children with high levels of impairment
  – miss many who have more subtle issues
  – children who may be great responders to intervention
Problems in Early Identification

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• Use of checklists of developmental skills, do not provide standardized cut-offs that indicate a need for referral
Problems in Early Identification

• Fewer than 30% of children with developmental delays are identified before entering school
• While we may find children with high levels of impairment
  – miss many who have more subtle issues
  – children who may be great responders to intervention
• Use of checklists of developmental skills, do not provide standardized cut-offs that indicate a need for referral
• Validated tools provide standardized data to guide practice and assure uniform care for all patients
Identifying Infants & Young Children with Developmental Disorders in the Medical Home: An Algorithm for Developmental Surveillance & Screening

Council on Children with Disabilities
Section on Developmental / Behavioral Pediatrics
Bright Futures Steering Committee
Medical Home Initiatives for CSHCN

*Pediatrics* 2006;118:405-420
Developmental Surveillance
Definition: Developmental Surveillance

“A flexible, longitudinal, continuous, and cumulative process whereby knowledgeable health care professionals identify children who may have developmental problems”

(AAP 2006)
5 Parts to Developmental Surveillance

1. Role of parent concern
2. Use of developmental history
3. Role of observation
4. Risk and protective factor assessment
   a) Environmental
   b) Biologic
   c) Genetic
   d) Social and demographic
5. Documentation
Developmental screening

• “The administration of a brief standardized tool aiding the identification of children at risk of a developmental disorder”
  - Brief
  - Standardized
  - Identification of risk
  - NOT DIAGNOSTIC
Developmental Surveillance

Developmental Screening

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Developmental Screening

• All children, most of whom will not have identifiable risks or whose development appears normal

• In the absence of established risk factors or parental or provider concerns:
  » 9 months
  » 18 months
  » 24 or 30 months

Nancy Swigonski, MD, MPH, FAAP
nswigons@iupui.edu
Identifying Infants And Young Children With Developmental Disorders In The Medical Home:
Algorithm For Developmental Surveillance & Screening

1. Developmental surveillance at every well-child visit
Identifying Infants And Young Children With Developmental Disorders In The Medical Home:
Algorithm For Developmental Surveillance & Screening

1. Developmental surveillance at every well-child visit
2. Developmental screening using a standardized screening tool at 9, 18, or 24-30 months or when concern is expressed

Nancy Swigonski, MD, MPH, FAAP
nswigons@iupui.edu
1. Developmental surveillance at every well-child visit
2. Developmental screening using a standardized screening tool at 9, 18, or 24-30 months or when concern is expressed
3. If screening results are concerning, refer to:
   a. Medical evaluation
   b. Early intervention services
Identifying Infants And Young Children With Developmental Disorders In The Medical Home: Algorithm For Developmental Surveillance & Screening

1. Developmental surveillance at every well-child visit
2. Developmental screening using a standardized screening tool at 9, 18, or 24-30 months or when concern is expressed
3. If screening results are concerning, refer to:
   a. Developmental evaluation
   b. Medical evaluation
   c. Early intervention services
4. Continually track child’s developmental status
Developmental Surveillance and Screening Algorithm Within a Pediatric Preventive Care Visit

1. Pediatric Patient at Preventive Care Visit
   2. Perform Surveillance
      3. Does Surveillance Demonstrate Risk?
         3a. Yes
         4. Is this a 0-, 12-, or 30-month visit?
            4a. Yes
            5. Administrator Screening Tool
               5a. Are the Screening Tool Results Positive / Concerning?
               5b. Yes
               6. Administrator Screening Tool
                  6a. Are the Screening Tool Results Positive / Concerning?
                  7. Make Referrals for Developmental and Medical Evaluations & Early Developmental Intervention / Early Childhood Services
                     8. Developmental and Medical Evaluations
                        9. Is a Developmental Disorder Identified?
                           9a. No
                           10. Schedule Early Return Visit
                               9b. Yes
                                   11. Identify as a Child with Special Health Care Needs
                                       12. Initiate Chronic Condition Management

Legend:
- Start
- Action / Process
- Decision
- Stop

Increasing Developmental Concern

*Because the 30-month visit is not yet a part of the preventive care system and is often not reimbursable by third-party payers at this time, developmental screening can be performed at 24 months of age.*
Developmental Diagnostic Evaluation

- Trained and skilled primary care physician
- Pediatric subspecialist
  - Neurodevelopmental pediatricians, developmental and behavioral pediatricians, child neurologists, pediatric physiatrists, or child psychiatrists
- With early childhood professionals
  - Early childhood educators, child psychologists, speech language pathologists, audiologists, social workers, physical therapists, or occupational therapists.
- Explicit co-management plans with the family, specialist(s) and primary care
Aims of Medical Diagnostic Evaluation

• To identify an underlying etiology
• Provide greater understanding of child’s condition
• Treatment planning
  – Specific prognostic information
  – Genetic counseling - recurrence risk
  – Specific medical treatments for improved health and function of the child
  – Therapeutic intervention programming
General Developmental Screening Tools

- Ages and Stages Questionnaire
- Parents' Evaluation of Developmental Status (PEDS)
- Battelle Developmental Inventory (BDI) Screening Test
- Bayley Infant Neurodevelopmental Screener (BINS)
- Brigance Screens-II
- Infant Development Inventory
- Child Development Review
- Child Development Inventory (CDI)
- Denver-II Developmental Screening Test
Autism Screening

- Modified Checklist for Autism in Toddlers (M-CHAT)
- Autism Behavior Checklist (ABC)
- Checklist for Autism in Toddlers (CHAT)
- Modified Checklist for Autism in Toddlers-23 (CHAT-23)
- Pervasive Developmental Disorders Screening Test-II (PDDST-II) - Stage 1-Primary Care Screener
- Pervasive Developmental Disorders Screening Test-II (PDDST-II) - Stage 2-Developmental Clinic Screener
- Screening Tool for Autism in Two-Year-Olds (STAT)
- Social Communication Questionnaire (SCQ) (formerly Autism Screening Questionnaire-ASQ)
Critical Points

4. Early experiences can change brain development
5. Importance of developmental screening
6. We can do something about it
Rand Study
Key Findings of Early Intervention Programs

*Early Childhood Interventions Proven Results, Future Promise;* Lynn A. Karoly M. Rebecca Kilburn, Jill S. Cannon. Prepared for Labor and Population, 2005
Rand Study
Types of Intervention Programs

a. Parent education and family supports through home visiting or services provided in other settings

b. Early childhood education, typically in a center-based setting, for one or two years prior to school access

c. Combines the two approaches

Early Childhood Interventions Proven Results, Future Promise; Lynn A. Karoly M. Rebecca Kilburn, Jill S. Cannon. Prepared for Labor and Population, 2005
Rand Study
Key Findings of Early Intervention Programs

1. Are high quality early intervention programs effective?
2. What are the attributes of high quality programs?
3. What is the return on investment (ROI)?

Early Childhood Interventions Proven Results, Future Promise; Lynn A. Karoly M. Rebecca Kilburn, Jill S. Cannon. Prepared for Labor and Population, 2005
Early Treatment Effective Infant Health and Development Program

- 8 site randomized controlled trial of comprehensive early intervention
  - low birthweight, premature infants
  - first 3 years of life
  - three intervention modalities
    - home visits
    - child centers
    - parent meetings

Early Treatment Effective Infant Health and Development Program

• *Intellectual development at 24 and 36 mos*
  – associated with each of the three intervention modalities
  – not associated with children's background characteristics (i.e., maternal education, birth weight)
  – findings represent a dose-response relation between intervention and outcome

<table>
<thead>
<tr>
<th>Home Visiting or Parent Education</th>
</tr>
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<tbody>
<tr>
<td>DARE to be You</td>
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<tr>
<td>Developmentally Supportive Care: Newborn Individualized</td>
</tr>
<tr>
<td>Developmental Care and Assessment Program*</td>
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<tr>
<td>HIPPY (Home Instruction Program for Preschool Youngsters) USA</td>
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<tr>
<td>Incredible Years</td>
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<tr>
<td>Nurse-Family Partnership Program</td>
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<tr>
<td>Parents as Teachers*</td>
</tr>
<tr>
<td>Project CARE (Carolina Approach to Responsive Education) —</td>
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<tr>
<td>without early childhood education</td>
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<tr>
<td>Reach Out and Read*</td>
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<table>
<thead>
<tr>
<th>Home Visiting or Parent Education Combined with Early</th>
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<tbody>
<tr>
<td>Childhood Education</td>
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<tr>
<td>Carolina Abecedarian Project</td>
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<tr>
<td>Chicago Child-Parent Centers</td>
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<tr>
<td>Early Head Start*</td>
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<tr>
<td>Early Training Project</td>
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<tr>
<td>Head Start</td>
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<tr>
<td>High/Scope Perry Preschool Project</td>
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<tr>
<td>Houston Parent-Child Development Center</td>
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<tr>
<td>Infant Health and Development Program</td>
</tr>
<tr>
<td>Project CARE—with early childhood education</td>
</tr>
<tr>
<td>Syracuse Family Development Research Program</td>
</tr>
</tbody>
</table>
Rand Study
Key Findings of Early Intervention Programs

Studies going back 30 years have shown that intervention in the first 3 years can improve outcomes.
Rand Study
Key Findings of Early Intervention Programs

- academic achievement
- behavior
- educational progression and attainment
- delinquency and crime
- labor market success

Early Childhood Interventions Proven Results, Future Promise; Lynn A. Karoly M. Rebecca Kilburn, Jill S. Cannon. Prepared for Labor and Population, 2005

Nancy Swigonski, MD, MPH, FAAP
nswigons@iupui.edu
Rand Study
Key Findings of Early Intervention Programs

• Interventions with more favorable results
  – Better-trained caregivers
  – Smaller child-to-staff ratios
  – Parental involvement

Early Childhood Interventions Proven Results, Future Promise; Lynn A. Karoly M. Rebecca Kilburn, Jill S. Cannon. Prepared for Labor and Population, 2005
Rand Study
Key Findings of Early Intervention Programs

Well-designed early childhood interventions have been found to generate a return to society ranging from $1.80 to $17.07 for each dollar spent on the program.

Early Childhood Interventions Proven Results, Future Promise; Lynn A. Karoly M. Rebecca Kilburn, Jill S. Cannon. Prepared for Labor and Population, 2005

Nancy Swigonski, MD, MPH, FAAP
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ROI for Proven Early Childhood Strategies

<table>
<thead>
<tr>
<th>Program</th>
<th>Return per $1 Invested</th>
</tr>
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<tbody>
<tr>
<td>Abecedarian Project (early care and education aged 0-5)</td>
<td>$3.23</td>
</tr>
<tr>
<td>Nurse Family Partnership (home visiting prenatal – age 2 for high risk group)</td>
<td>$5.70</td>
</tr>
<tr>
<td>Perry Preschool (early education age 3-4)</td>
<td>$9.20</td>
</tr>
</tbody>
</table>

Break-Even Point: $2

Center on the Developing Child at Harvard University, Karoly et al. 2005, Heckman et al. 2009
Welcome to Indiana
Crossroads of America
“That it will ever come into general use, notwithstanding its value, is extremely doubtful because its beneficial application requires much time and gives a good bit of trouble, both to the patient and to the practitioner because its hue and character are foreign and opposed to all our habits and associations.”
The Stethoscope

“That it will ever come into general use, notwithstanding its value, is extremely doubtful because its beneficial application requires much time and gives a good bit of trouble, both to the patient and to the practitioner because its hue and character are foreign and opposed to all our habits and associations.”

*London Times, 1834*
Developmental Screening
Percent of children receiving a standardized screening for developmental or behavioral problems (age 10 months-5 years)

2011/12 National Survey of Children’s Health

Nationwide: 30.8% of children met indicator
Range Across States: 17.5% to 58.0%
• More children in Indiana have developmental delay than nationally - IN 4.9% vs. US 3.6%
• Fewer children ages 10 mos - 5 yrs receive developmental screening IN 24% vs. US 31%
# Students Identified with Autism Spectrum Disorder in Indiana’s Public Schools

Rise in Autism Spectrum Disorders

<table>
<thead>
<tr>
<th>School Year</th>
<th>Number of Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>87-88</td>
<td>0</td>
</tr>
<tr>
<td>88-89</td>
<td>2,000</td>
</tr>
<tr>
<td>89-90</td>
<td>4,000</td>
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<td>90-91</td>
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<td>52,000</td>
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<td>14-15</td>
<td>54,000</td>
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</tbody>
</table>

Nancy Swigonski, MD, MPH, FAAP
nswigons@iupui.edu
Portion of Children Diagnosed with ASD by Age Group

<table>
<thead>
<tr>
<th>Age at Diagnosis</th>
<th>Nationwide</th>
<th>Indiana</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth to 2 years</td>
<td>27%</td>
<td>13%</td>
</tr>
<tr>
<td>3 to 5 years of age</td>
<td>45%</td>
<td>46%</td>
</tr>
<tr>
<td>6 to 10 years of age</td>
<td>22%</td>
<td>34%</td>
</tr>
</tbody>
</table>

Average age of diagnosis in Indiana = 63 months

• Long travel times
• Long waiting lists
• Late diagnosis
• Inconsistent diagnosis
• Difficulty coordinating with community resources

Nancy Swigonski, MD, MPH, FAAP
nswigons@iupui.edu
Improving early identification and diagnosis of developmental delay and autism spectrum disorders

Nancy Swigonski, MD, MPH
Mary Jo Paladino, MSA
Angela Paxton, BS
Mary Delaney, BA
Kara Casavan, BS
Kyle Baugh, BS

Angela Tomlin, PhD, HSPP
Cassie Karlsson, MD
Tom Lock, MD
Dorota Szczepaniak, MD
Katie Swec, MD
What are we trying to accomplish? How will we know that a change is an improvement?

**Aim**

Decrease the age of diagnosis of DD/ASD from 5 years to under 3 years in Indiana over 3 years.

---

Nancy Swigonski, MD, MPH, FAAP
nswigons@iupui.edu
Implementation Science
Defining Core Elements or “Drivers”

- Community based screening (ASQ, MCHAT)
- Utilization of evidence based standardized diagnostic assessment (STAT and ADOS)
- Quality improvement and tracking of data
  - Sharing of best practices, experiences, data
- Community focus to ensure receipt of services
  - Family-centered
  - Community including schools, businesses, health care and other local entities serving children
Autism Clinical Sorting Algorithm: 18-36 Months

I. Primary Care
   A. Call center
      B. Is the child being referred for autism?
         Yes
         No ASD
         Refer to DD/ADHD/Other Clinics
         Refer back to PCP
         No
         Does child have established dx for autism?
         Yes
         No ASD
         Refer to DD/ADHD/Other Clinics
         Refer back to PCP
         No
         Does an appropriate health care provider make dx?
         Yes
         No ASD
         Refer to DD/ADHD/Other Clinics
         Refer back to PCP
         No
         Does patient want a second opinion?
         Yes
         III. Diagnostic Clinic D.
         No
         II. Intake Clinic C.
         Does child have diagnosis of ASD?
         Yes
         IV. Comprehensive autism clinic E.
         No
         Does child have symptoms of ASD?
         Yes
         III. Diagnostic Clinic D.
         No
         No ASD
         Refer to DD/ADHD/Other Clinics
         Refer back to PCP
         No ASD
         Refer to DD/ADHD/Other Clinics
         Refer back to PCP
The image depicts a community hub referral system. At the center, there is a Specialty Referral node connected by arrows to various other nodes, including Community Hub Referral, Schools, Partnering Organizations, Families, Primary Care, Community Resources, and Businesses. The system is designed to facilitate referrals and connections between different community services and resources.
Plan Do, Study, & Act (PDSA)
Small incremental tests of change
Drivers or Core Elements
What changes can we make that will result in an improvement?

Global AIM
Decrease the age of diagnosis of DD/ASD from 5 years to under 3 years in Indiana over 24 months

- Primary care do evidence-based screening
- Rapid access to diagnosis
- Utilization of tiered system with evidence-based, standardized assessments
- Quality tracking of services and performance
- Work with community including schools, other care providers, family organizations
Data from Primary Care Physicians

MCHAT: 24 month

Goal

<table>
<thead>
<tr>
<th>MCHAT</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>Aug</th>
<th>Sept</th>
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<tbody>
<tr>
<td># Screened</td>
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<td># Passed</td>
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Drivers or Core Elements
What changes can we make that will result in an improvement?

Global AIM
Decrease the age of diagnosis of DD/ASD from 5 years to under 3 years in Indiana over 24 months

- Primary care do evidence-based screening
- Rapid access to diagnosis
- Utilization of tiered system with evidence based, standardized assessments
- Quality tracking of services and performance
- Work with community including schools, other care providers, family organizations
Developmental and Autism Screening Outreach

- 9 Early Evaluation Hubs
- 1 Future Early Evaluation Hub
- 108 Primary Care Visits
- 35 Grand Rounds/CME Events
- 87 Community Visits
- 32 School Visits
Drivers or Core Elements
What changes can we make that will result in an improvement?

Global AIM

 Decrease the age of diagnosis of DD/ASD from 5 years to under 3 years in Indiana over 24 months

Primary care do evidence-based screening

Rapid access to diagnosis

Utilization of tiered system with evidence based, standardized assessments

Quality tracking of services and performance

Work with community including schools, other care providers, family organizations
Parkview Children’s Clinic
11115 Parkview Plaza Dr.
Fort Wayne, IN 46845
T 260.266.5400

Beacon Medical Group
Centennial Health Center
621 Centennial Dr., # 402
South Bend, IN 46601
T 574.647.2500

Suzanne Gresham Center
3620 W. White River Blvd
Muncie, IN 47304
T 765.741.0324

Riley Outpatient Center (ROC)
575 Riley Hospital Dr., MSA 1
Indianapolis, IN 46202
T 317.944.4846
Deaconess Riley Children’s Specialty Center
4133 Gateway Blvd., Suite 220
Newburgh, IN 47630 (Near Evansville)
T 812.858.3143

IU Health Riley Physicians – Bloomington
4935 W. Arlington Rd.
Bloomington, IN 47404
T 812.353.3740

IU Health Arnett – Lafayette
2600 Greenbush
Lafayette, IN 47905
Internal health system referrals only

Nassim McMonigle & Mescia PC
2305 Green Valley Rd.
New Albany, IN 47150
T 812.949.0405

Union Associated Physicians (UAP Clinic)
221 S. Sixth St.,
Terre Haute, IN 47807
T 812.242.3105
92.7% of 0-4 year olds in the state
Average Age of Diagnosis in Indiana = 63.0 months
Average Age of Diagnosis in Indiana = 63.0 months
Goal = 36.0 months
Average Age of Diagnosis in Indiana = 63.0 months
Goal = 36.0 months
Average Age of ASD Diagnosis in All Community Hubs = 30.0 months
Average Age of DD Diagnosis in All Community Hubs = 29.6 months
Summary

• Early experiences shape the architecture of the brain
• Development of the brain incorporates experience, whether positive or negative
• Brain architecture establishes a sturdy or weak foundation for learning & behavior with life long consequences
• We can help by finding children at risk or with delays early & providing structured, evidence-based programs
Closing Thoughts

Early childhood development affects all of us!
Poverty and Child Health in the United States
COUNCIL ON COMMUNITY PEDIATRICS
Pediatrics; originally published online March 9, 2016;
DOI: 10.1542/peds.2016-0339
Children In Poverty (100 Percent Poverty)

Year(s): 5 selected | Data Type: All

Data Provided by: National KIDS COUNT

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INDICATOR CONTEXT

Growing up in poverty is one of the greatest threats to healthy child development. Poverty and financial stress can impede children’s cognitive development and their ability to learn. It can contribute to behavioral, social and emotional problems and poor health.

This indicator is included in the KIDS COUNT Child Well-Being Index. Read the KIDS COUNT Data Book to learn more: http://datacenter.kidscount.org/publications.

Nancy Swigonski, MD, MPH, FAAP
nswigons@iupui.edu
Children and Concentrated Poverty

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INDICATOR CONTEXT

Concentrated poverty puts whole neighborhoods, and the people living in them, at risk. High-poverty neighborhoods are much more likely than others to have high rates of crime and violence, physical and mental health issues, unemployment and other problems.

This indicator is included in the KIDS COUNT Child Well-Being Index. Read the KIDS COUNT Data Book to learn more: http://datacenter.kidscount.org/publications
Federal Reserve Chair Janet Yellen

• ...four sources of economic opportunity in America--think of them as "building blocks" for the gains in income and wealth that most Americans hope are within reach of those who strive for them

•

Janet Yellen, Chair, Board of Governors, Federal Reserve System of the United States. "Perspectives on Inequality and Opportunity from the Survey of Consumer Finances." Federal Reserve Bank of Boston, October 17, 2014
Federal Reserve Chair Janet Yellen

• ...four sources of economic opportunity in America--think of them as "building blocks" for the gains in income and wealth that most Americans hope are within reach of those who strive for them

• The first [is] widely recognized as important source of opportunity: resources available to children in their most formative years....One of the most consequential examples is early childhood education

Janet Yellen, Chair, Board of Governors, Federal Reserve System of the United States. "Perspectives on Inequality and Opportunity from the Survey of Consumer Finances." Federal Reserve Bank of Boston, October 17, 2014
75% of 18 year olds cannot get a job as a private in the US army
• 75% of 18 year olds cannot get a job as a private in the US army because
  – Lack of diploma
  – Health (obesity, asthma)
  – Criminal record
  – Drug / alcohol

Ready, Willing and Unable to Serve A report by Mission Readiness, Military Leaders for Kids www/cdn.missionreadiness.org
Benefits of Early Intervention Programs

- Academic achievement
- Behavior
- Educational progression and attainment
- Delinquency and crime
- Labor market success

Cannot Get a Job as a Private in Army

- Lack of diploma
- Health (obesity, asthma)
- Criminal record
- Drug / alcohol

Nancy Swigonski, MD, MPH, FAAP
nswigons@iupui.edu
Programs targeted at earliest months and years

Preschool programs

Primary, secondary schooling and college

Job training

Source: James Heckman, Schools, Skills, and Synapses, Economic Inquiry, 2008
Strong Communities

Successful Parenting of Next Generation

Educational Achievement
Economic Productivity
Responsible Citizenship
Lifelong Health

HEALTHY CHILD DEVELOPMENT


Nancy Swigonski, MD, MPH, FAAP
nswigons@iupui.edu
Source: Early Learning Left Out, Voices for America's Children and the Child and Family Policy Center, 2004.
Brain Growth and Public Investment

Source: Early Learning Left Out, Voices for America's Children and the Child and Family Policy Center, 2004.
Moments in America for Children

- Every 34 seconds a baby is born into poverty.
- Every 67 seconds a baby is born into extreme poverty.
- Every 1 1/2 minutes a baby is born at low birthweight.
- Every 22 minutes a baby dies before their first birthday.


Nancy Swigonski, MD, MPH, FAAP
nswigons@iupui.edu
Where America Stands Among Industrialized Nations

• 1st in Gross Domestic Product
• 1st in the number of millionaires and billionaires
• 1st in health technology
• 11th in the proportion of children living in poverty
• 16th in efforts to lift children out of poverty
• 17th in rates of low-birthweight births
• 22nd in infant mortality

http://www.thechildrensinitiative.org/didyouknow.htm
Improving early identification and diagnosis of developmental delay and autism spectrum disorders

Nancy Swigonski, MD, MPH
Mary Jo Paladino, MSA
Angela Paxton, BS
Mary Delaney, BA
Kara Casavan, BS
Kyle Baugh, BS

Angela Tomlin, PhD, HSPP
Cassie Karlsson, MD
Tom Lock, MD
Dorota Szczepaniak, MD
Katie Swec, MD

Riley Children’s Foundation
Kiwanis INDIANA
SCHOOL OF MEDICINE
INDIANA UNIVERSITY
Indiana State Department of Health
Child Health Improvement Partnership Indiana
THANK YOU!!!
What is Autism Spectrum Disorder?

• A group of complex disorders of brain development
• Characterized by difficulties in
  – Social communication (verbal and nonverbal)
  – Restricted interests / repetitive behaviors
• Associated with intellectual disability in 50-70%
• Most obvious signs and symptoms of autism emerge between 2 and 3 years of age

http://www.cdc.gov/ncbddd/autism/index.html
How Common is Autism?

• 1 in 68*
  – Girls 1/252
  – Boys 1/54 (4-5 X more common than girls)

• 10X increase in prevalence in 40 years

http://www.cdc.gov/ncbddd/autism/index.html
What Causes Autism?

• No one cause of autism and no one type of autism
• Gene changes or mutations associated with autism
• Combination of autism risk genes and environmental factors influencing early brain development
  – genetic predisposition to autism
  – nongenetic, or “environmental,” stresses -- advanced parental age at time of conception (both mom and dad), maternal illness during pregnancy and difficulties during birth

http://www.cdc.gov/ncbddd/autism/index.html
When Can ASD Be Identified?

• Sibling research (Mitchell et al, 2006)
  – 12 month - differences in gesture and receptive language
  – 15% siblings had ASD at 2 years of age

• Home movies looking back at children with ASD at 12-18 months of age (Palomo et al, 2006)
  – Less pointing to share an interest
  – Less eye contact as integrated communicative act
  – Less communicative babbling
  – No response to name
  – Confirms a regression in a third (33-39%)

• Screening 18 and 24 months of age with tool

  http://www.cdc.gov/ncbddd/autism/index.html